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DOE Quality Assurance Working Group Suspect/Counterfeit Item Advisory Improper Heat Treatment of Aluminum Alloys

Purpose

This Advisory provides information on the improper heat treatment, hardness testing, and falsification of records on high-strength, corrosion-resistant, aluminum alloys allegedly performed by the West Coast Aluminum Heat Treating Company (West Coast).

Background

The primary source of information for this Advisory is the Government-Industry Data Exchange Program (GIDEP)[1] Problem Advisory EQ3-A-98-01, "Heat Treating of Aluminum Alloys," dated 5 August 1998. The GIDEP advisory reports that West Coast has been suspended from doing business with the U.S. Government and has been indicted by a U.S. District Court in California. Additionally, West Coast is under investigation by the Defense Criminal Investigative Service. The West Coast heat treating facility has been purchased by and is operating under the name of Temperform Heat Treating USA. The GIDEP Advisory is reproduced on the Quality Assurance Working Group (QAWG) Web Site, url: www.sci.doe.gov.

The Federal Aviation Administration (FAA) issued an Airworthiness Directive (AD) on 5/6/88 in regard to some aluminum alloy products heat treated by West Coast and installed in certain models of Bell helicopters. The FAA re-issued an AD on 11/10/97 on other products heat treated by West Coast. According to the FAA data, only the military surplus Bell UH-1 models were affected.

Issue

The GIDEP Problem Advisory contains numerous examples of improperly heat treated aluminum alloy products in the 7000 series for military and commercial customers and records falsified by West Coast between 1980 and 1997. The examples cited include:

- Short solution heat treatment times and falsification of furnace records.
- Unapproved/improper equipment used for solution heat treatment incapable of quenching alloy forms within specified time limits.
- Failure to hold at specified temperature for specified time following solution heat treatment; falsification of furnace records.
- Inadequate/broken equipment incapable of reaching specified hot-quenching temperatures.
- Improperly shortened precipitation heat treatment times; records falsified.
- Hardness testing records falsified and inadequate sampling inspection.

Safety Implications

Aluminum alloy products heat treated by West Coast may lack tensile strength and resistance to stress-corrosion cracking. Properly heat-treated, the 7000-series aluminum alloys have the highest tensile strength of any aluminum alloys. High tensile strength is achieved by the addition of zinc and magnesium and by precipitation heat treating, or tempering, following solid-solution heat treating and rapid quenching, each step performed in strict accordance with American Society for Testing and Materials (ASTM) standards, military specifications, or customer specifications. Tensile property limits of some Alloy 7075 wrought products range from a maximum of 40 ksi in the as-received T0

temper to a maximum of 77 ksi in the precipitation hardened T6 temper. Superior resistance to stress-corrosion cracking is also achieved, such as in Alloy 7075- T173 or –T351 tempers, through proper heat treatment. Cast and wrought 7000-series aluminum alloy products in tempered conditions are extensively used in aircraft, helicopters, ordnance, and other special military and commercial applications, such as those described in the GIDEP Problem Advisory, because of their high strength and superior corrosion resistance.

Discussion

Initial searches by some DOE field and contractor organizations have yielded a few discoveries of high-strength aluminum alloy products heat-treated by West Coast. One industrial safety application has been identified to date. This application involves two aluminum alloy ring forgings used in special lifting and handling equipment at a DOE site. Contractor receipt inspection and test data on the ring forgings have determined that there is no safety hazard or environmental impact.

Several DOE sites have confirmed that there are no West Coast processed parts installed in helicopters or in spares at these sites. The determination was made through a review of Bell Helicopter Company records maintained on serial-numbered, high-strength aluminum parts. None of the Bell helicopter models covered by the two FAA ADs have been in service at DOE facilities. Due to the limited need for the special properties attained in high-strength aluminum alloys and the results of initial searches, they are not expected to be in the DOE complex.

Actions to be Considered

DOE Field Elements should coordinate with their contractor engineering and procurement organizations to ensure that appropriate actions are taken to identify, report, evaluate, and disposition high strength aluminum alloys items heat treated by West Coast. All such actions must be in accordance with the suspect/counterfeit items (S/CI) requirements of DOE Order 440.1A and in consideration of the guidance provided in DOE G 440.1-6. This Advisory requires no additional actions or response beyond those of the Order and Guide. The QAWG will monitor and track this issue, review reports of discoveries, and make this information available through its web site.

Contact

The QAWG has designated Mr. Roy Capshaw, DOE-NV, as the point of contact for this Advisory. For further information regarding content, please contact Mr. Capshaw by phone: at 702-295-1377; by fax: at 702-295-0689; or by e-mail capshaw@nv.doe.gov. For information on the status of this and other Advisories issued by the DOE Office of Nuclear Safety Policy and Standards, please call Mr. Gustave Danielson by phone at 301-903-2954 or by e-mail at bud.danielson@eh.doe.gov.

References

ASTM B597-92, “Standard Practice for Heat Treatment of Aluminum Alloys,” 27 April 1992, Section 6, Heat Treat Procedure.

DOE G 440.1-6, “Implementation Guide for use with Suspect/Counterfeit Items,” June 1997.

[1]For further information on GIDEP, please contact Mr. Tom Rotella, the DOE GIDEP Representative, by phone at 301-903-2649 or by e-mail at thomas.rotella@dp.doe.gov.

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